EUROPEAN PATENT OFFICE

Patent Abstracts of Japan

PUBLICATION NUMBER : 2000218666
PUBLICATION DATE : 08-08-00

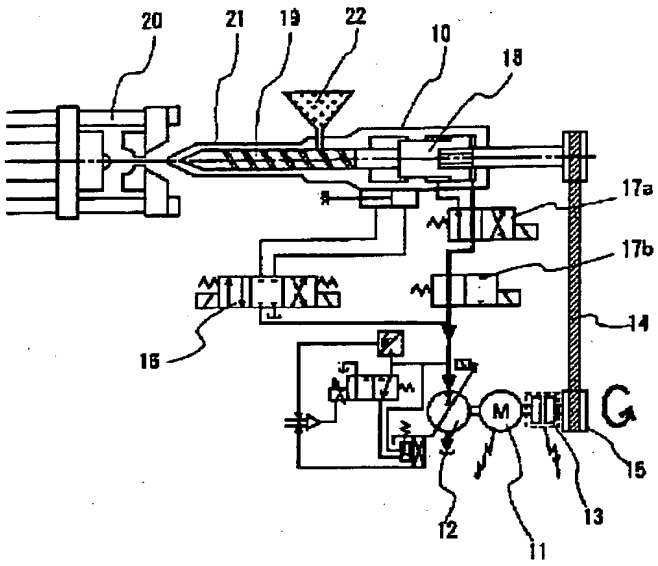
APPLICATION DATE : 29-01-99
APPLICATION NUMBER : 11021402

APPLICANT : YUKEN KOGYO CO LTD;

INVENTOR : OBA KOICHI;

INT.CL. : B29C 45/50 B29C 45/76

TITLE : HYDRAULIC-ELECTROMOTIVE HYBRID INJECTION MOLDING APPARATUS



ABSTRACT : PROBLEM TO BE SOLVED: To obtain a hydraulic-electromotive hybrid injection molding apparatus taking in the beneficial points of both of hydraulic and electromotive systems and reduced in the number of drive motors.

SOLUTION: In a hydraulic-electromotive hybrid injection molding apparatus, a raw material resin is weighed to be introduced into a heating cylinder 21 by rotationally driving a screw 19 in the heating cylinder 21 to be kneaded and plasticized and an injection cylinder 8 is allowed to advance by fluid pressure driving to inject the plasticized resin in a mold to fill the mold. In this case, as the drive motor driving the screw 19 to weigh and introduce the raw material resin and the drive motor driving a fluid pressure pump motor 12 discharging the drive fluid of the injection cylinder 18, the same servo motor 11 controlled in its number of rotations is used and a clutch 13 is provided in the rotation transmitting system from the servo motor 11 to the screw 19.

(19)日本国特許庁（ＪＰ）　(12)公開特許公報（Ａ）　(11)特許出願公開番号
特開2000－218666
（P2000－218666A）
(43)公開日　平成12年８月８日(2000.8.8)

(51)Int.Cl.'	識別記号	ＦＩ	ﾃｰﾏｺｰﾄﾞ(参考)
Ｂ２９Ｃ　45/50		Ｂ２９Ｃ　45/50	４Ｆ２０６
45/76		45/76	

審査請求　未請求　請求項の数３．ＯＬ　（全６頁）

(21)出願番号　特願平11－21402

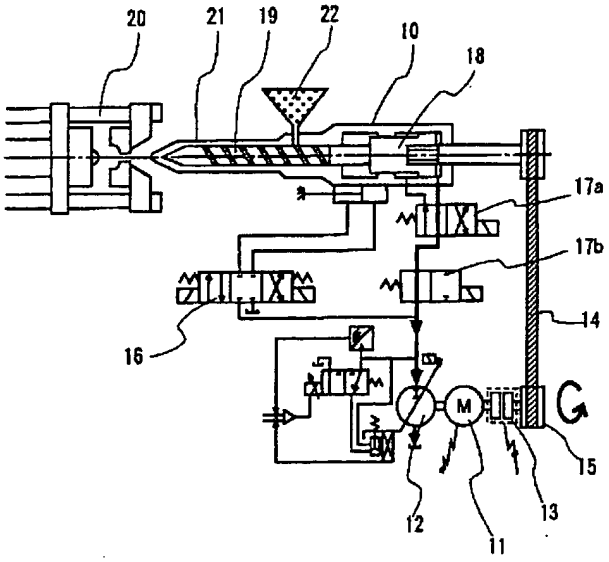
(22)出願日　平成11年１月29日(1999.1.29)

(71)出願人　000246251
油研工業株式会社
神奈川県藤沢市宮前１番地
(72)発明者　橋本　登志雄
神奈川県高座郡寒川町倉見1745－14
(72)発明者　服部　志朗
神奈川県厚木市愛甲149
(72)発明者　大場　孝一
神奈川県横須賀市浦上台２－27　１－153
(74)代理人　100092082
弁理士　佐藤　正年　（外１名）

Ｆターム(参考)　4F206 AR027 AR14 JA07 JD03
JF48 JM01 JT02 JT03 JT05
JT21 JT22 JT33 JT37

(54)【発明の名称】　油圧－電動ハイブリッド型射出成形装置

(57)【要約】
【課題】　油圧式と電動式との双方の長所を取り入れた射出成形装置であって、駆動モータ数を減少させた油圧－電動ハイブリッド型射出成形装置を得る。
【解決手段】　加熱シリンダ内のスクリューを回転駆動することにより加熱シリンダ内に原料樹脂を計量導入し、該原料樹脂を混練可塑化した後、射出シリンダを流体圧駆動で前進させて可塑化樹脂を金型内に射出充填する射出成形装置において、前記スクリューを回転駆動して原料樹脂を計量導入する駆動原動機と、前記射出シリンダの駆動流体を排出する流体圧ポンプモータを駆動する駆動原動機とを同一の回転数制御可能なサーボモータとし、該サーボモータから前記スクリューへの回転伝達系内にクラッチを介装したもの。



【特許請求の範囲】
【請求項１】　加熱シリンダ内のスクリューを回転駆動することにより加熱シリンダ内に原料樹脂を計量導入し、該原料樹脂を混練可塑化した後、射出シリンダを流体圧駆動で前進させて可塑化樹脂を金型内に射出充填する射出成形装置において、
前記スクリューを回転駆動して原料樹脂を計量導入する駆動原動機と、前記射出シリンダの駆動流体を排出する流体圧ポンプモータを駆動する駆動原動機とを同一の回転数制御可能なサーボモータとし、
該サーボモータから前記スクリューへの回転伝達系内にクラッチを介装したことを特徴とする油圧－電動ハイブリッド型射出成形装置。
【請求項２】　請求項１に記載された油圧－電動ハイブリッド型射出成形装置において、
前記スクリューを回転駆動して原料樹脂を計量導入する際に前記射出シリンダから排出される流体を流体圧ポンプモータに流入させる動力回収用作動流体回路と、
前記動力回収用作動流体回路内で前記流体圧ポンプモータに流入する流体流量及び／又は圧力を制御する制御手段とを備えたことを特徴とする油圧－電動ハイブリッド型射出成形装置。
【請求項３】　請求項１に記載された油圧－電動ハイブリッド型射出成形装置において、
前記スクリューを回転駆動して原料樹脂を計量導入する際に前記射出シリンダから排出される流体の圧力を蓄えるアキュムレータ手段と、
前記アキュムレータ手段の蓄圧値を予め定められた圧力範囲に調製する圧力調整手段とを備えたことを特徴とする油圧－電動ハイブリッド型射出成形装置。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】本発明は例えば油圧式と電動式との双方の長所を取り入れた射出成形装置であって、駆動モータ数を減少させた油圧－電動ハイブリッド型射出成形装置に関し、特に省エネルギー化を図った油圧－電動ハイブリッド型射出成形装置に関するものである。
【０００２】
【従来の技術】従来、射出成形機は、油圧を利用した代表的な機械の一つであった。しかしながら、高効率（省エネ）であるオール電動式の射出成形機と比べて、省エネルギーの点で、未だ改良の余地があった。
【０００３】元来、油圧式は、成形機の機能に適合しており、省エネ問題を解決できれば、型締め、射出と言ったパワーを大きく必要とする工程では、特に有効である。
【０００４】
【発明が解決しようとする課題】従って、本発明は、油圧式と電動式との双方の長所を取り入れた射出成形装置であって、駆動モータ数を減少させた油圧－電動ハイブリッド型射出成形装置を得ることを目的とし、特に、省エネルギー化を図った油圧－電動ハイブリッド型射出成形装置を得ることを更に別の目的とする。
【０００５】
【課題を解決するための手段】請求項１に記載された発明に係る油圧－電動ハイブリッド型射出成形装置では、加熱シリンダ内のスクリューを回転駆動することにより加熱シリンダ内に原料樹脂を計量導入し、該原料樹脂を混練可塑化した後、射出シリンダを流体圧駆動で前進させて可塑化樹脂を金型内に射出充填する射出成形装置において、前記スクリューを回転駆動して原料樹脂を計量導入する駆動原動機と、前記射出シリンダの駆動流体を排出する流体圧ポンプモータを駆動する駆動原動機とを同一の回転数制御可能なサーボモータとし、該サーボモータから前記スクリューへの回転伝達系内にクラッチを介装したものである。
【０００６】請求項２に記載された発明に係る油圧－電動ハイブリッド型射出成形装置では、請求項１に記載された油圧－電動ハイブリッド型射出成形装置において、前記スクリューを回転駆動して原料樹脂を計量導入する際に前記射出シリンダから排出される流体を流体圧ポンプモータに流入させる動力回収用作動流体回路と、前記動力回収用作動流体回路内で前記流体圧ポンプモータに流入する流体流量及び／又は圧力を制御する制御手段とを備えたものである。
【０００７】請求項３に記載された発明に係る油圧－電動ハイブリッド型射出成形装置では、請求項１に記載された油圧－電動ハイブリッド型射出成形装置において、前記スクリューを回転駆動して原料樹脂を計量導入する際に前記射出シリンダから排出される流体の圧力を蓄えるアキュムレータ手段と、前記アキュムレータ手段の蓄圧値を予め定められた圧力範囲に調製する圧力調整手段とを備えたものである。
【０００８】
【発明の実施の形態】本発明においては、スクリューを回転駆動して原料樹脂を計量導入する駆動原動機と、前記射出シリンダの駆動流体を排出する流体圧ポンプモータを駆動する駆動原動機とを同一の回転数制御可能なサーボモータとし、このサーボモータから前記スクリューへの回転伝達系内にクラッチを介装している。これにより、駆動原動機数を減少させることができる。更には、スクリューを駆動する原動機と流体圧を発生させるポンプモータを駆動する原動機とを同一のものとしたことにより、特別な流体圧回路を組むことにより、省エネルギー化が図れる。
【０００９】例えば、スクリューを回転駆動して原料樹脂を計量導入する時に射出シリンダの背圧を制御すると共に、この背圧を利用してスクリューを回動しているサーボモータの駆動を助成することにより省エネルギー化を行うこと、同じくスクリューを回転駆動して原料樹脂

を計量導入する時に射出シリンダの背圧を制御すると共に、この背圧を利用してアキュムレータ手段に蓄圧し、これを別の油圧源として利用することにより省エネルギー化を行うことなどが挙げられる。

【００１０】具体的には、スクリューを回転駆動して原料樹脂を計量導入する際に射出シリンダから排出される流体を流体圧ポンプモータに流入させる動力回収用作動流体回路と、この動力回収用作動流体回路内で前記流体圧ポンプモータに流入する流体流量及び／又は圧力を制御する制御手段とを備えることにより、射出シリンダ背圧を利用してスクリューを回動しているサーボモータの駆動を助成することにより省エネルギー化を行うことができる。

【００１１】また別の具体例としては、スクリューを回転駆動して原料樹脂を計量導入する際に射出シリンダから排出される流体の圧力を蓄えるアキュムレータ手段と、このアキュムレータ手段の蓄圧値を予め定められた圧力範囲に調製する圧力調整手段とを備えることにより、射出シリンダ背圧を利用してアキュムレータ手段に蓄圧し、これを別の油圧源として利用することにより省エネルギー化を行うことができる。

【００１２】

【実施例】実施例１．計量工程１（動力回収モータ方式）

図１は本発明の射出成形装置での計量工程の一実施例のシステム構成を示す説明図である。図に示す通り、本実施例の射出成形装置は、射出成形機(10)と、型締め機(20)と、油圧回路と、電動回路とからなる。駆動原動機はサーボモータ(11)であり、このサーボモータ(11)の一端軸に可変油圧ポンプモータ(12)が連結され、他端軸に電磁クラッチ(13)が連結されている。

【００１３】電磁クラッチ(13)には、タイミングベルト(14)用のプーリ(15)が装着されている。タイミングベルト(14)を経て電磁クラッチ(13)の回転を射出成形機(10)の後端から射出シリンダ(18)を介してスクリュー(19)に伝える。スクリュー(19)の周囲はヒータが装着された加熱シリンダ(21)である。

【００１４】加熱シリンダ(21)内部では、、ホッパ(22)から引き込んだ樹脂原料を混練可塑化し、射出成型機(10)を前進させて先端のノズル(23)を型締め機(20)で型締められた金型に突き合わせ、金型内に可塑化樹脂を射出シリンダ(18)の前進力で射出する。本実施例の射出成形装置では、この射出シリンダ(18)の前進力、射出成形機(10)の前進力、型締め機(20)の型締め等のパワーを大きく必要とする工程に流体圧としての油圧を用いる。

【００１５】油圧を発生させる可変油圧ポンプモータ(12)には、リザーバタンク用電磁弁(16)と油圧制御用電磁弁(17a)(17b)との３個の電磁弁が包含された１つのユニットとして構成されている。

【００１６】計量工程時には、可変油圧ポンプモータ(12)はサーボモータ(11)で駆動され、電磁クラッチ(13)はＯＮ状態として、サーボモータ(11)の駆動をプーリ(15)からタイミングベルト(14)を経て射出成形機(10)の後端から射出シリンダ(18)を介してスクリュー(19)に伝える。即ち、計量工程のスクリュー回転はサーボモータ(11)駆動となる。

【００１７】また、電磁弁(16)(17a)(17b)は、ＯＦＦ状態として、図１に示すような射出シリンダ(18)ヘッド部から排出される流体を流体圧ポンプモータに流入させる動力回収用の油圧回路を構成する。

【００１８】サーボモータ(11)を駆動してホッパ(22)から加熱シリンダ(21)に樹脂原料を計量しつつ引き入れる。この時、射出シリンダ(18)は後進するが、射出シリンダ(18)を徐々に後進させて正確な計量を行わせるため計量背圧制御を行う。本実施例では、油圧の調節手段として可変油圧ポンプモータ(12)の斜板角を制御することにより、計量背圧を制御する。

【００１９】前述の通り、可変油圧ポンプモータ(12)はサーボモータ(11)で駆動しているため、可変油圧ポンプモータ(12)の斜板角を制御することにより、この背圧によって油圧ポンプに連結されたモータにトルクを発生させ、サーボモータの駆動を助成する所謂「動力回収方式」となる。この動力回収分が更に省エネ効果を生み出す。従って、この工程においては、電動成形機よりも更に消費エネルギーが減少する。これに対して、従来の油圧方式の場合は、リリーブ弁による背圧制御を行うので、全てが熱によって消費される。この観点から比較すると、大幅な省エネが得られることになる。

【００２０】尚、本実施例では、サーボモータ(11)とスクリュー(19)とは、プーリ(15)及びタイミングベルト(14)を介して駆動を伝えているが、スクリューを駆動する回転軸を直接電磁クラッチ(13)に接続しても良い。この場合には、可変油圧ポンプモータ(12)は更にその外側に配置される。

【００２１】実施例２．射出・ノズル後退・シフトシリンダ伸縮工程

図２は図１に示した射出成形装置での射出・ノズル後退・シフトシリンダ伸縮工程でのシステム構成を示す説明図である。図に示す通り、この工程では、電磁クラッチ(13)をＯＦＦとし、サーボモータ(11)は油圧ポンプモータ(12)の駆動電動機となる。油圧ポンプモータ(12)は斜板角を一定として通常のポンプ機能として作用する。

【００２２】即ち、この工程では、油圧ポンプモータ(12)は定吐出ポンプとなり、流量、圧力制御はサーボモータ(11)の回転数制御で行う。即ち、流量制御時は、Ｑ＝ｑ×ＮのＮを制御し、機械が要求する流量と吐出量とする。また、圧力制御は吐出側に設置された圧力センサー信号（図示せず）により、サーボモータ(11)が正逆－停止－逆転を繰り返し、圧力制御を行う。

【００２３】また、後述する型制御工程中（型開閉、突

き出し等）は、サーボモータ(11)は停止している。従来の油圧方式の場合、モータは一定回転で運転しており、ポンプ斜板角制御又はバルブ制御で実施しており、それに比較すると大幅な省エネが実現する。

【００２４】実施例３．型制御工程

図３は本発明の射出成形装置での型締め機の型制御のシステム構成を示す説明図である。図に示す通り、型締め機(20)は、型制御用サーボモータ(31)と、定吐出ポンプ(32)と、型締め制御用電磁弁(33)とを用いて開閉駆動される。尚、定吐出ポンプ(32)には、突き出し制御用電磁弁(34)が分岐して設置されており、図示しない突き出し機構を制御する。

【００２５】型制御側（型開閉、突き出し）も、型制御用サーボモータ(31)と定吐出ポンプ(32)との組み合わせで、モータ回転数制御により、流量、圧力制御を行う。これにより、型制御工程以外の工程では、サーボモータ(31)を停止することにより、大幅な省エネが実現する。

【００２６】実施例４．計量工程２（アキュムレータ方式）

図４は本発明の射出成形装置での計量工程の別の実施例のシステム構成を示す説明図である。図１に示した実施例では、スクリューを回動しているサーボモータの駆動を助成することにより省エネルギー化を図ったが、本実施例では、の背圧を利用してアキュムレータに蓄圧し、これを別の油圧源として利用することにより省エネルギー化を図るものである。

【００２７】図に示す通り、本実施例の射出成形装置は、射出成形機(40)と、型締め機(50)と、油圧回路と、電動回路とからなる。駆動源はサーボモータ(41)であり、このモータ(41)の一端軸に油圧ポンプ(42)が連結され、他端軸に電磁クラッチ(43)が連結されている。

【００２８】電磁クラッチ(43)には、タイミングベルト(44)用のプーリ(45)が装着されている。タイミングベルト(44)を経て電磁クラッチ(43)の回転を射出成形機(40)の後端から射出シリンダ(48)を介してスクリュー(49)に伝える。スクリュー(49)の周囲はヒータが装着された加熱シリンダ(51)である。

【００２９】加熱シリンダ(51)内部では、ホッパ(52)から引き込んだ樹脂原料を混練可塑化し、射出成型機(40)を前進させて先端のノズル(53)を型締め機(50)で型締められた金型に突き合わせ、金型内に可塑化樹脂を射出シリンダ(48)の前進力で射出する。

【００３０】油圧を発生させる油圧ポンプ(42)には、リザーバタンク用電磁弁(46)と油圧制御用電磁弁(47a)(47b)(47c)との４個の電磁弁が包含された１つのユニットとして構成されている。

【００３１】計量工程時には、油圧ポンプ(42)はサーボモータ(41)で駆動され、電磁クラッチ(43)はＯＮ状態として、サーボモータ(41)の駆動をプーリ(45)からタイミングベルト(44)を経て射出成形機(40)の後端から射出シリンダ(48)を介してスクリュー(49)に伝える。即ち、計量工程のスクリュー回転はサーボモータ(41)駆動となる。

【００３２】また、電磁弁(46)(47a)(47b)(47c)のうち、電磁弁(47b)は計量時以外はＯＮ状態（ブロック状態）とし、電磁弁(47c)はポンプ吸い込みラインに強制放出時のみＯＮとして、図１に示すような射出シリンダ(48)ヘッド部からアキュムレータ(55)に至るアキュムレータ用の油圧回路を構成する。

【００３３】サーボモータ(41)を駆動してホッパ(52)から加熱シリンダ(51)に樹脂原料を計量しつつ引き入れる。この時、射出シリンダ(48)は後進するが、射出シリンダ(48)が徐々に後進するように計量背圧制御を行う。本実施例では、アキュムレータ(55)には圧力センサ（図示せず）を持っており、背圧指令圧力を一定に保つようにアキュムレータ(55)に接続されたサーボモータ(56)の回転制御を実施（圧力調整機能付きアキュムレータ）して一定圧力の油圧エネルギーを蓄圧する。

【００３４】蓄圧された油圧は、成型品を金型から取り出す際のエジェクタシリンダの駆動用に利用でき、或いはポンプの高速立ち上がり時に吹き込みラインに放出し、吹き込み性能向上に寄与させる。これにより、ポンプの高速立ち上がり時の消費エネルギーが減少し、大幅な省エネが得られることになる。

【００３５】尚、図４に示した実施例の場合、射出・ノズル後退・シフトシリンダ伸縮工程及び型制御工程は、図１に示した場合と同等であるため、説明を省略する。

【００３６】以上説明したように、従来の油圧方式に比較し、大幅な省エネルギーが実現できる。オール電動方式にほぼ近似のエネルギー消費となる。本実施例の場合、２個又は３個ののサーボモータで構成することができ、高価なサーボモータの使用個数を減少することができるため、安価に構成できる。（オール電動の場合、軽量・射出・型締め工程用と、各工程ごとにサーボモータを数個（一般的には５個使用）使用することと比較して）

【００３７】

【発明の効果】本発明は以上説明した通り、駆動モータ数を減少させた油圧－電動ハイブリッド型射出成形装置を得ることができる。更に、省エネルギー化を図った油圧－電動ハイブリッド型射出成形装置を得ることができる。

【図面の簡単な説明】

【図１】本発明の射出成形装置での計量工程の一実施例のシステム構成を示す説明図である。

【図２】図１に示した射出成形装置での射出・ノズル後退・シフトシリンダ伸縮工程でのシステム構成を示す説明図である。

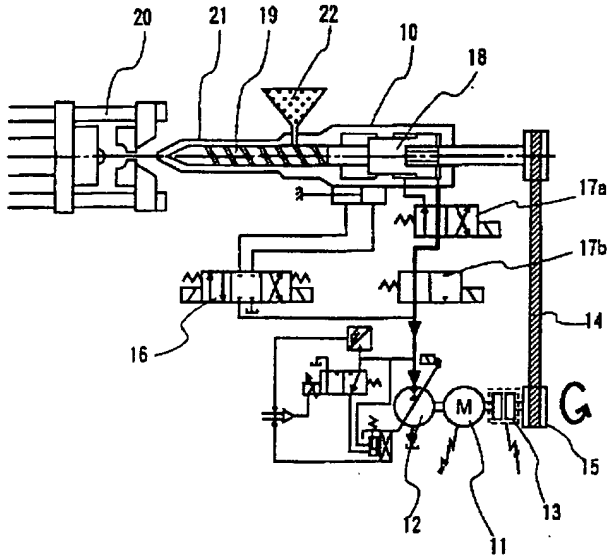
【図３】本発明の射出成形装置での型締め機の型制御のシステム構成を示す説明図である。

【図４】本発明の射出成形装置での計量工程の別の実施例のシステム構成を示す説明図である。

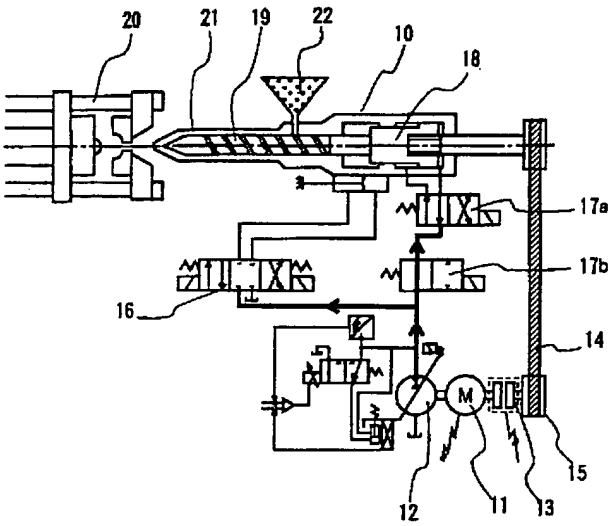
【符号の説明】

(10)(40)　…射出成形機、
(11)(41)　…サーボモータ、
(12)　…可変油圧ポンプモータ、
(42)　…油圧ポンプ、
(13)(43)　…電磁クラッチ、
(14)(44)　…タイミングベルト、
(15)(45)　…プーリ、
(16)(46)　…リザーバタンク用電磁弁、
(17a)(17b)　…油圧制御用電磁弁、
(47a)(47b)(47c)…油圧制御用電磁弁、
(18)(48)　…射出シリンダ、
(19)(49)　…スクリュー、
(20)(50)　…型締め機、
(21)(51)　…加熱シリンダ、
(22)(52)　…ホッパ、
(31)　…型制御用サーボモータ、
(32)　…定吐出ポンプ、
(33)　…型締め制御用電磁弁、
(34)　…突き出し制御用電磁弁、
(55)　…アキュムレータ、
(56)　…サーボモータ、

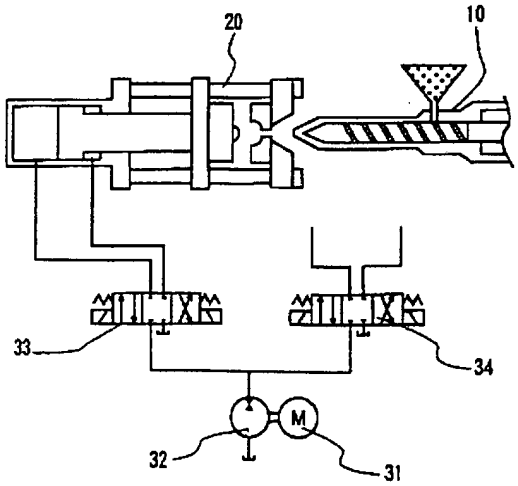
【図１】



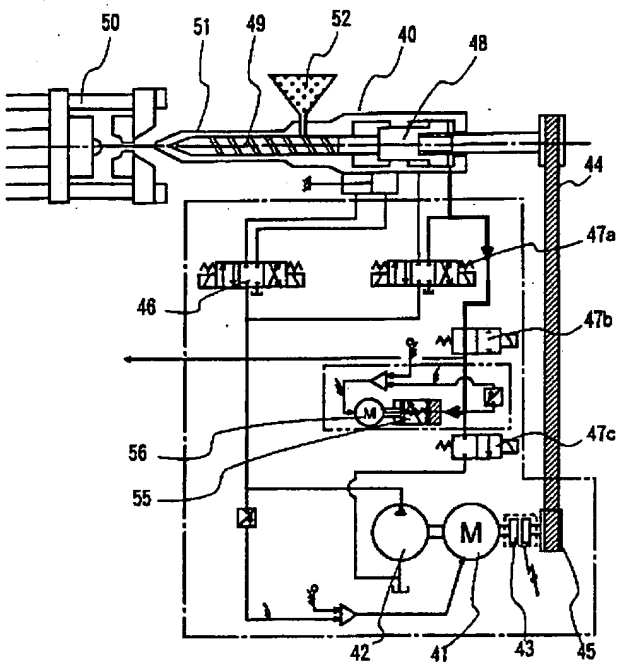
【図２】



【図３】



【図4】



* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] Measuring installation of the raw material resin is carried out into a heating cylinder by carrying out revolution actuation of the screw in a heating cylinder. In the injection-molding equipment which a injection cylinder is advanced by hydrostatic pressure actuation, and carries out injection restoration of the plasticization resin into metal mold after carrying out kneading plasticization of this raw material resin The actuation prime mover which carries out revolution actuation of said screw, and carries out measuring installation of the raw material resin, Oil pressure-electric hybrid mold injection-molding equipment which uses the actuation prime mover which drives the hydrostatic pressure pump motor which discharges the actuation fluid of said injection cylinder as the servo motor in which the same revolving speed control is possible, and is characterized by infixing a clutch into the rotation transfer system from this servo motor to said screw.
[Claim 2] The oil pressure-electric hybrid mold injection molding equipment characterize by to have the working fluid circuit for power recovery which make the fluid discharge from said injection cylinder in case the revolution actuation of said screw carry out and the measuring installation of the raw material resin carry out in the oil pressure-electric hybrid mold injection molding equipment indicated by claim 1 flow into a hydrostatic pressure pump motor , and the control means which control the fluid flow rate and/or the pressure which flow into said hydrostatic pressure pump motor in said working fluid circuit for power recovery .
[Claim 3] The oil-pressure-electric hybrid mold injection-molding equipment characterized by to have an accumulator means conserve the pressure of the fluid discharged from said injection cylinder in case revolution actuation of said screw is carried out and measuring installation of the raw material resin is carried out in the oil-pressure-electric hybrid mold injection-molding equipment indicated by claim 1, and a pressure-regulation means prepare the pressure-accumulation value of said accumulator means to the pressure range which was able to be appointed beforehand.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention is injection-molding equipment which took in the advantage of an oil pressure controller and the both sides of being electromotive, and relates to the oil pressure-electric hybrid mold injection-molding equipment which attained especially energy saving about the oil pressure-electric hybrid mold injection-molding equipment which decreased the number of drive motors.

[0002]
[Description of the Prior Art] Conventionally, the injection molding machine was one of the typical machines using oil pressure. However, compared with the injection molding machine of the all electric type which is a well head (energy saving), there was still room of amelioration at the point of energy saving.
[0003] Originally, if the oil pressure controller conforms to the function of a making machine and an energy-saving problem is solvable, it is effective at especially the process that needs the power called eye a mold clamp and injection greatly.
[0004]
[Problem(s) to be Solved by the Invention] Therefore, this invention is injection-molding equipment which took in the advantage of an oil pressure controller and the both sides of being electromotive, and sets it as still more nearly another object to obtain the oil pressure-electric hybrid mold injection-molding equipment which attained energy saving especially for the purpose of obtaining the oil pressure-electric hybrid mold injection-molding equipment which decreased the number of drive motors.

[0005]
[Means for Solving the Problem] With the oil pressure-electric hybrid mold injection-molding equipment concerning invention indicated by claim 1 Measuring installation of the raw material resin is carried out into a heating cylinder by carrying out revolution actuation of the screw in a heating cylinder. In the injection-molding equipment which a injection cylinder is advanced by hydrostatic pressure actuation, and carries out injection restoration of the plasticization resin into metal mold after carrying out kneading plasticization of this raw material resin The actuation prime mover which carries out revolution actuation of said screw, and carries out measuring installation of the raw material resin, The actuation prime mover which drives the hydrostatic pressure pump motor which discharges the actuation fluid of said injection cylinder is used as the servo motor in which the same revolving speed control is possible, and a clutch is infixed into the rotation transfer system from this servo motor to said screw.
[0006] With the oil pressure-electric hybrid mold injection-molding equipment concerning invention indicated by claim 2 In the oil pressure-electric hybrid mold injection-molding equipment indicated by claim 1 The working-fluid circuit for power recovery which makes the fluid discharged from said injection cylinder in case revolution actuation of said screw is carried out and measuring installation of the raw material resin is carried out flow into a hydrostatic pressure pump motor, It has the control

means which controls the fluid flow rate and/or pressure which flow into said hydrostatic pressure pump motor in said working-fluid circuit for power recovery.
[0007] With the oil-pressure-electric hybrid mold injection-molding equipment concerning invention indicated by claim 3, it has an accumulator means conserve the pressure of the fluid discharged from said injection cylinder in case revolution actuation of said screw is carried out and measuring installation of the raw material resin is carried out, and a pressure-regulation means prepare the pressure-accumulation value of said accumulator means to the pressure range which was able to be appointed beforehand, in the oil-pressure-electric hybrid mold injection-molding equipment indicated by claim 1.
[0008]
[Embodiment of the Invention] In this invention, the actuation prime mover which carries out revolution actuation of the screw and carries out measuring installation of the raw material resin, and the actuation prime mover which drives the hydrostatic pressure pump motor which discharges the actuation fluid of said injection cylinder are used as the servo motor in which the same revolving speed control is possible, and the clutch is infixed into the revolution transfer system from this servo motor to said screw. Thereby, decrease little ****** can do the number of actuation prime movers. Furthermore, energy saving can be attained by constructing a special hydrostatic pressure circuit by having made into the same thing the prime mover which drives a screw, and the prime mover which drives the pump motor made to generate hydrostatic pressure.
[0009] For example, when carrying out revolution actuation of the screw and carrying out measuring installation of the raw material resin, while controlling the back pressure of a injection cylinder Saving the energy by supporting actuation of the servo motor which is rotating the screw using this back pressure, when carrying out revolution actuation of the screw similarly and carrying out measuring installation of the raw material resin, while controlling the back pressure of a injection cylinder Pressure is accumulated for an accumulator means using this back pressure, and saving the energy by using this as another hydraulic power unit etc. is mentioned.
[0010] The working-fluid circuit for power recovery which makes the fluid discharged from a injection cylinder in case revolution actuation of the screw is carried out and measuring installation of the raw material resin is specifically carried out flow into a hydrostatic pressure pump motor, By having the control means which controls the fluid flow rate and/or pressure which flow into said hydrostatic pressure pump motor in this working-fluid circuit for power recovery The energy can be saved by supporting actuation of the servo motor which is rotating the screw using injection cylinder back pressure.
[0011] Moreover, by having an accumulator means conserve the pressure of the fluid discharged from a injection cylinder in case revolution actuation of the screw is carried out and measuring installation of the raw material resin is carried out as another example, and a pressure regulation means prepare the pressure accumulation value of this accumulator means to the pressure range which was able to be appointed beforehand, pressure can be accumulated for an accumulator means using injection cylinder back pressure, and the energy can be saved by using this as another hydraulic power unit.
[0012]
[Example] Example 1. measuring process 1 (power recovery motor method)
Drawing 1 is the explanatory view showing the system configuration of one example of the measuring process in the injection-molding equipment of this invention. The injection-molding equipment of this example consists of an injection molding machine (10), a mold clamp machine (20) and a hydraulic circuit, and an electric circuit as shown in drawing. An actuation prime mover is a servo motor (11), an adjustable hydraulic pump-motor (12) is connected with the end shaft of this servo motor (11), and the electromagnetic clutch (13) is connected with the other end shaft.
[0013] The electromagnetic clutch (13) is equipped with the pulley (15) for timing belts (14). A revolution of an electromagnetic clutch (13) is told to a screw (19) through a injection cylinder (18) through a timing belt (14) from the back end of an injection molding machine (10). The perimeter of a screw (19) is the heating cylinder (21) equipped with the heater.
[0014] Inside a heating cylinder (21), kneading plasticization of the resin raw material drawn from the

hopper (22) is carried out, an injection molding machine (10) is advanced, the nozzle (23) at a head is compared to mold clamp **** metal mold with a mold clamp machine (20), and plasticization resin is injected by the ahead power of a injection cylinder (18) in metal mold. The oil pressure as hydrostatic pressure is used for the process which needs greatly power of the ahead power of this injection cylinder (18), the ahead power of an injection molding machine (10), and a mold clamp machine (20), such as eye a mold clamp, with the injection-molding equipment of this example.

[0015] It is constituted by the adjustable hydraulic pump-motor (12) made to generate oil pressure as one unit with which three solenoid valves of the solenoid valve for reservoir tanks (16) and the solenoid valve for oil pressure controls (17a) (17b) were included.

[0016] At the time of a measuring process, an adjustable hydraulic pump-motor (12) is driven with a servo motor (11), and an electromagnetic clutch (13) tells actuation of a servo motor (11) at it to a screw (19) as an ON condition through the back end of an injection molding machine (10) to a injection cylinder (18) through a timing belt (14) from a pulley (15). That is, the screw revolution of a measuring process serves as servo motor (11) actuation.

[0017] Moreover, a solenoid valve (16) (17a) (17b) constitutes the hydraulic circuit for power recovery which makes the fluid discharged as an OFF condition from the injection cylinder (18) head section as shown in drawing 1 flow into a hydrostatic pressure pump motor.

[0018] It draws in driving a servo motor (11) and measuring a resin raw material from a hopper (22) to a heating cylinder (21). Although a injection cylinder (18) goes astern at this time, in order to reverse a injection cylinder (18) gradually and to make exact measuring perform, measuring back-pressure control is performed. Measuring back pressure is controlled by this example by controlling the cam-plate angle of an adjustable hydraulic pump-motor (12) as an accommodation means of oil pressure.

[0019] Since the adjustable hydraulic pump-motor (12) is driven with the servo motor (11) as above-mentioned, by controlling the cam-plate angle of an adjustable hydraulic pump-motor (12), the motor connected with the hydraulic pump by this back pressure is made to generate torque, and it becomes the so-called "power recovery method" which supports actuation of a servo motor. The amount of this power recovery produces the energy-saving effectiveness further. Therefore, in this process, consumption energy decreases further rather than an electric making machine. On the other hand, since back-pressure control by the RIRIBU valve is performed in the case of the conventional oil hydraulic system, all are consumed by heat. When it compares from this viewpoint, large energy saving will be obtained.

[0020] In addition, in this example, although the servo motor (11) and the screw (19) have told actuation through the pulley (15) and the timing belt (14), they may connect to a direct electromagnetic clutch (13) the revolving shaft which drives a screw. In this case, an adjustable hydraulic pump-motor (12) is arranged further on that outside.

[0021] Example 2. injection and nozzle retreat / shift cylinder flexible process drawing 2 is an explanatory view showing the system configuration in injection and nozzle retreat / shift cylinder flexible process in the injection-molding equipment shown in drawing 1 . At this process, an electromagnetic clutch (13) is set to OFF and a servo motor (11) serves as a driving motor of a hydraulic pump-motor (12) as shown in drawing. A hydraulic pump-motor (12) sets a cam-plate angle constant, and acts as usual pumping ability.

[0022] That is, at this process, a hydraulic pump-motor (12) serves as a constant regurgitation pump, and performs a flow rate and pressure control by the revolving speed control of a servo motor (11). Namely, N of Q=qxN is controlled at the time of control of flow, and it makes it the flow rate and discharge quantity which a machine requires. Moreover, with the pressure-sensor signal (not shown) installed in the discharge side, a servo motor (11) repeats a forward reverse-halt-inversion, and pressure control performs pressure control.

[0023] moreover, the mold control mentioned later -- being in process (mold closing motion, ejection, etc.) -- the servo motor (11) has stopped. In the case of the conventional oil hydraulic system, the motor is operated by the fixed revolution, it is carrying out by pump cam-plate angle control or the valve control, and large energy saving is realized as compared with it.

[0024] The example 3. mold control process drawing 3 is an explanatory view showing the system configuration of mold control of the mold clamp machine in the injection-molding equipment of this invention. Closing motion actuation of the mold clamp machine (20) is carried out using the servo motor for mold control (31), and a constant regurgitation pump (32) and the solenoid valve for mold clamp control (33) as shown in drawing. In addition, the solenoid valve for ejection control (34) is branched and installed in the constant regurgitation pump (32), and the ejection device which is not illustrated is controlled.
[0025] A mold control side (mold closing motion, ejection) also performs a flow rate and pressure control by motor revolving speed control in the combination of the servo motor for mold control (31), and a constant regurgitation pump (32). Thereby, at processes other than a mold control process, large energy saving is realized by suspending a servo motor (31).
[0026] Example 4. measuring process 2 (accumulator method)
Drawing 4 is the explanatory view showing the system configuration of another example of the measuring process in the injection-molding equipment of this invention. Although energy saving was attained by supporting actuation of the servo motor rotating around a screw in the example shown in drawing 1 , in this example, pressure is accumulated to an accumulator using the back pressure of **, and energy saving is attained by using this as another hydraulic power unit.
[0027] The injection-molding equipment of this example consists of an injection molding machine (40), a mold clamp machine (50) and a hydraulic circuit, and an electric circuit as shown in drawing. A driving source is a servo motor (41), a hydraulic pump (42) is connected with the end shaft of this motor (41), and the electromagnetic clutch (43) is connected with the other end shaft.
[0028] The electromagnetic clutch (43) is equipped with the pulley (45) for timing belts (44). A revolution of an electromagnetic clutch (43) is told to a screw (49) through a injection cylinder (48) through a timing belt (44) from the back end of an injection molding machine (40). The perimeter of a screw (49) is the heating cylinder (51) equipped with the heater.
[0029] Inside a heating cylinder (51), kneading plasticization of the resin raw material drawn from the hopper (52) is carried out, an injection molding machine (40) is advanced, the nozzle (53) at a head is compared to mold clamp **** metal mold with a mold clamp machine (50), and plasticization resin is injected by the ahead power of a injection cylinder (48) in metal mold.
[0030] It is constituted by the hydraulic pump (42) made to generate oil pressure as one unit with which four solenoid valves of the solenoid valve for reservoir tanks (46) and the solenoid valve for oil pressure controls (47a) (47b) (47c) were included.
[0031] At the time of a measuring process, a hydraulic pump (42) is driven with a servo motor (41), and an electromagnetic clutch (43) tells actuation of a servo motor (41) at it to a screw (49) as an ON condition through the back end of an injection molding machine (40) to a injection cylinder (48) through a timing belt (44) from a pulley (45). That is, the screw revolution of a measuring process serves as servo motor (41) actuation.
[0032] Moreover, among solenoid valves (46) (47a) (47b) (47c), a solenoid valve (47b) is made into ON condition (block status) except the time of measuring, and a solenoid valve (47c) constitutes the hydraulic circuit for accumulators from the injection cylinder (48) head section as shows as ON a pump absorption line at drawing 1 only at the time of compulsive bleedoff to an accumulator (55).
[0033] It draws in driving a servo motor (41) and measuring a resin raw material from a hopper (52) to a heating cylinder (51). Although a injection cylinder (48) goes astern at this time, measuring back-pressure control is performed so that a injection cylinder (48) may go astern gradually. In this example, it has a pressure sensor (not shown) in the accumulator (55), and the roll control of the servo motor (56) connected to the accumulator (55) so that a back pressure command pressure might be kept constant is carried out (accumulator with a pressure regulation function), and the oil pressure energy of a constant pressure is accumulated.
[0034] The oil pressure by which pressure accumulation was carried out is applicable to actuation of the ejector cylinder at the time of picking out a cast from metal mold, or is blown at the time of the high-speed standup of a pump, is emitted to a line, and is made to contribute to the improvement in the

entrainment engine performance. By this, the consumption energy at the time of the high-speed standup of a pump will decrease, and large energy saving will be obtained.
[0035] In addition, since injection and nozzle retreat / shift cylinder flexible process and the mold control process are equivalent to the case where it is shown in drawing 1 in the case of the example shown in drawing 4 , explanation is omitted.
[0036] As explained above, as compared with the conventional oil hydraulic system, large energy saving is realizable. It becomes approximate energy expenditure mostly at an all electric method. In the case of this example, it can constitute from a servo motor of two pieces or three-piece **, and since it can decrease, the activity number of an expensive servo motor can be constituted cheaply. (oar -- using some (five pieces being used generally) servo motors for every process with a light weight, injection, and the object for mold clamp processes, when electric -- comparing)
[0037]
[Effect of the Invention] This invention can obtain the oil pressure-electric hybrid mold injection-molding equipment which decreased the number of drive motors as it was explained above. Furthermore, the oil pressure-electric hybrid mold injection-molding equipment aiming at energy saving can be obtained.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

TECHNICAL FIELD

[Field of the Invention] This invention is injection-molding equipment which took in the advantage of an oil pressure controller and the both sides of being electromotive, and relates to the oil pressure-electric hybrid mold injection-molding equipment which attained especially energy saving about the oil pressure-electric hybrid mold injection-molding equipment which decreased the number of drive motors.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

PRIOR ART

[Description of the Prior Art] Conventionally, the injection molding machine was one of the typical machines using oil pressure. However, compared with the injection molding machine of the all electric type which is a well head (energy saving), there was still room of amelioration at the point of energy saving.
[0003] Originally, if the oil pressure controller conforms to the function of a making machine and an energy-saving problem is solvable, it is effective at especially the process that needs the power called eye a mold clamp and injection greatly.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

EFFECT OF THE INVENTION

[Effect of the Invention] This invention can obtain the oil pressure-electric hybrid mold injection-molding equipment which decreased the number of drive motors as it was explained above. Furthermore, the oil pressure-electric hybrid mold injection-molding equipment aiming at energy saving can be obtained.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] Therefore, this invention is injection-molding equipment which took in the advantage of an oil pressure controller and the both sides of being electromotive, and sets it as still more nearly another object to obtain the oil pressure-electric hybrid mold injection-molding equipment which attained energy saving especially for the purpose of obtaining the oil pressure-electric hybrid mold injection-molding equipment which decreased the number of drive motors.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

MEANS

[Means for Solving the Problem] With the oil pressure-electric hybrid mold injection-molding equipment concerning invention indicated by claim 1 Measuring installation of the raw material resin is carried out into a heating cylinder by carrying out revolution actuation of the screw in a heating cylinder. In the injection-molding equipment which a injection cylinder is advanced by hydrostatic pressure actuation, and carries out injection restoration of the plasticization resin into metal mold after carrying out kneading plasticization of this raw material resin The actuation prime mover which carries out revolution actuation of said screw, and carries out measuring installation of the raw material resin, The actuation prime mover which drives the hydrostatic pressure pump motor which discharges the actuation fluid of said injection cylinder is used as the servo motor in which the same revolving speed control is possible, and a clutch is infixed into the rotation transfer system from this servo motor to said screw.
[0006] With the oil pressure-electric hybrid mold injection-molding equipment concerning invention indicated by claim 2 In the oil pressure-electric hybrid mold injection-molding equipment indicated by claim 1 The working-fluid circuit for power recovery which makes the fluid discharged from said injection cylinder in case revolution actuation of said screw is carried out and measuring installation of the raw material resin is carried out flow into a hydrostatic pressure pump motor, It has the control means which controls the fluid flow rate and/or pressure which flow into said hydrostatic pressure pump motor in said working-fluid circuit for power recovery.
[0007] With the oil-pressure-electric hybrid mold injection-molding equipment concerning invention indicated by claim 3, it has an accumulator means conserve the pressure of the fluid discharged from said injection cylinder in case revolution actuation of said screw is carried out and measuring installation of the raw material resin is carried out, and a pressure-regulation means prepare the pressure-accumulation value of said accumulator means to the pressure range which was able to be appointed beforehand, in the oil-pressure-electric hybrid mold injection-molding equipment indicated by claim 1.
[0008]
[Embodiment of the Invention] In this invention, the actuation prime mover which carries out revolution actuation of the screw and carries out measuring installation of the raw material resin, and the actuation prime mover which drives the hydrostatic pressure pump motor which discharges the actuation fluid of said injection cylinder are used as the servo motor in which the same revolving speed control is possible, and the clutch is infixed into the revolution transfer system from this servo motor to said screw. Thereby, decrease little ****** can do the number of actuation prime movers. Furthermore, energy saving can be attained by constructing a special hydrostatic pressure circuit by having made into the same thing the prime mover which drives a screw, and the prime mover which drives the pump motor made to generate hydrostatic pressure.
[0009] For example, when carrying out revolution actuation of the screw and carrying out measuring installation of the raw material resin, while controlling the back pressure of a injection cylinder Saving the energy by supporting actuation of the servo motor which is rotating the screw using this back pressure, when carrying out revolution actuation of the screw similarly and carrying out measuring installation of the raw material resin, while controlling the back pressure of a injection cylinder Pressure

is accumulated for an accumulator means using this back pressure, and saving the energy by using this as another hydraulic power unit etc. is mentioned.
[0010] The working-fluid circuit for power recovery which makes the fluid discharged from a injection cylinder in case revolution actuation of the screw is carried out and measuring installation of the raw material resin is specifically carried out flow into a hydrostatic pressure pump motor, By having the control means which controls the fluid flow rate and/or pressure which flow into said hydrostatic pressure pump motor in this working-fluid circuit for power recovery The energy can be saved by supporting actuation of the servo motor which is rotating the screw using injection cylinder back pressure.
[0011] Moreover, by having an accumulator means conserve the pressure of the fluid discharged from a injection cylinder in case revolution actuation of the screw is carried out and measuring installation of the raw material resin is carried out as another example, and a pressure regulation means prepare the pressure accumulation value of this accumulator means to the pressure range which was able to be appointed beforehand, pressure can be accumulated for an accumulator means using injection cylinder back pressure, and the energy can be saved by using this as another hydraulic power unit.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

EXAMPLE

[Example] Example 1. measuring process 1 (power recovery motor method)
Drawing 1 is the explanatory view showing the system configuration of one example of the measuring process in the injection-molding equipment of this invention. The injection-molding equipment of this example consists of an injection molding machine (10), a mold clamp machine (20) and a hydraulic circuit, and an electric circuit as shown in drawing. An actuation prime mover is a servo motor (11), an adjustable hydraulic pump-motor (12) is connected with the end shaft of this servo motor (11), and the electromagnetic clutch (13) is connected with the other end shaft.
[0013] The electromagnetic clutch (13) is equipped with the pulley (15) for timing belts (14). A revolution of an electromagnetic clutch (13) is told to a screw (19) through a injection cylinder (18) through a timing belt (14) from the back end of an injection molding machine (10). The perimeter of a screw (19) is the heating cylinder (21) equipped with the heater.
[0014] Inside a heating cylinder (21), kneading plasticization of the resin raw material drawn from the hopper (22) is carried out, an injection molding machine (10) is advanced, the nozzle (23) at a head is compared to mold clamp **** metal mold with a mold clamp machine (20), and plasticization resin is injected by the ahead power of a injection cylinder (18) in metal mold. The oil pressure as hydrostatic pressure is used for the process which needs greatly power of the ahead power of this injection cylinder (18), the ahead power of an injection molding machine (10), and a mold clamp machine (20), such as eye a mold clamp, with the injection-molding equipment of this example.
[0015] It is constituted by the adjustable hydraulic pump-motor (12) made to generate oil pressure as one unit with which three solenoid valves of the solenoid valve for reservoir tanks (16) and the solenoid valve for oil pressure controls (17a) (17b) were included.
[0016] At the time of a measuring process, an adjustable hydraulic pump-motor (12) is driven with a servo motor (11), and an electromagnetic clutch (13) tells actuation of a servo motor (11) at it to a screw (19) as an ON condition through the back end of an injection molding machine (10) to a injection cylinder (18) through a timing belt (14) from a pulley (15). That is, the screw revolution of a measuring process serves as servo motor (11) actuation.
[0017] Moreover, a solenoid valve (16) (17a) (17b) constitutes the hydraulic circuit for power recovery which makes the fluid discharged as an OFF condition from the injection cylinder (18) head section as shown in drawing 1 flow into a hydrostatic pressure pump motor.
[0018] It draws in driving a servo motor (11) and measuring a resin raw material from a hopper (22) to a heating cylinder (21). Although a injection cylinder (18) goes astern at this time, in order to reverse a injection cylinder (18) gradually and to make exact measuring perform, measuring back-pressure control is performed. Measuring back pressure is controlled by this example by controlling the cam-plate angle of an adjustable hydraulic pump-motor (12) as an accommodation means of oil pressure.
[0019] Since the adjustable hydraulic pump-motor (12) is driven with the servo motor (11) as above-mentioned, by controlling the cam-plate angle of an adjustable hydraulic pump-motor (12), the motor connected with the hydraulic pump by this back pressure is made to generate torque, and it becomes the so-called "power recovery method" which supports actuation of a servo motor. The amount of this

power recovery produces the energy-saving effectiveness further. Therefore, in this process, consumption energy decreases further rather than an electric making machine. On the other hand, since back-pressure control by the RIRIBU valve is performed in the case of the conventional oil hydraulic system, all are consumed by heat. When it compares from this viewpoint, large energy saving will be obtained.

[0020] In addition, in this example, although the servo motor (11) and the screw (19) have told actuation through the pulley (15) and the timing belt (14), they may connect to a direct electromagnetic clutch (13) the revolving shaft which drives a screw. In this case, an adjustable hydraulic pump-motor (12) is arranged further on that outside.

[0021] Example 2. injection and nozzle retreat / shift cylinder flexible process drawing 2 is an explanatory view showing the system configuration in injection and nozzle retreat / shift cylinder flexible process in the injection-molding equipment shown in drawing 1 . At this process, an electromagnetic clutch (13) is set to OFF and a servo motor (11) serves as a driving motor of a hydraulic pump-motor (12) as shown in drawing. A hydraulic pump-motor (12) sets a cam-plate angle constant, and acts as usual pumping ability.

[0022] That is, at this process, a hydraulic pump-motor (12) serves as a constant regurgitation pump, and performs a flow rate and pressure control by the revolving speed control of a servo motor (11). Namely, N of Q=qxN is controlled at the time of control of flow, and it makes it the flow rate and discharge quantity which a machine requires. Moreover, with the pressure-sensor signal (not shown) installed in the discharge side, a servo motor (11) repeats a forward reverse-halt-inversion, and pressure control performs pressure control.

[0023] moreover, the mold control mentioned later -- being in process (mold closing motion, ejection, etc.) -- the servo motor (11) has stopped. In the case of the conventional oil hydraulic system, the motor is operated by the fixed revolution, it is carrying out by pump cam-plate angle control or the valve control, and large energy saving is realized as compared with it.

[0024] The example 3. mold control process drawing 3 is an explanatory view showing the system configuration of mold control of the mold clamp machine in the injection-molding equipment of this invention. Closing motion actuation of the mold clamp machine (20) is carried out using the servo motor for mold control (31), and a constant regurgitation pump (32) and the solenoid valve for mold clamp control (33) as shown in drawing. In addition, the solenoid valve for ejection control (34) is branched and installed in the constant regurgitation pump (32), and the ejection device which is not illustrated is controlled.

[0025] A mold control side (mold closing motion, ejection) also performs a flow rate and pressure control by motor revolving speed control in the combination of the servo motor for mold control (31), and a constant regurgitation pump (32). Thereby, at processes other than a mold control process, large energy saving is realized by suspending a servo motor (31).

[0026] Example 4. measuring process 2 (accumulator method)

Drawing 4 is the explanatory view showing the system configuration of another example of the measuring process in the injection-molding equipment of this invention. Although energy saving was attained by supporting actuation of the servo motor rotating around a screw in the example shown in drawing 1 , in this example, pressure is accumulated to an accumulator using the back pressure of **, and energy saving is attained by using this as another hydraulic power unit.

[0027] The injection-molding equipment of this example consists of an injection molding machine (40), a mold clamp machine (50) and a hydraulic circuit, and an electric circuit as shown in drawing. A driving source is a servo motor (41), a hydraulic pump (42) is connected with the end shaft of this motor (41), and the electromagnetic clutch (43) is connected with the other end shaft.

[0028] The electromagnetic clutch (43) is equipped with the pulley (45) for timing belts (44). A revolution of an electromagnetic clutch (43) is told to a screw (49) through a injection cylinder (48) through a timing belt (44) from the back end of an injection molding machine (40). The perimeter of a screw (49) is the heating cylinder (51) equipped with the heater.

[0029] Inside a heating cylinder (51), kneading plasticization of the resin raw material drawn from the

hopper (52) is carried out, an injection molding machine (40) is advanced, the nozzle (53) at a head is compared to mold clamp **** metal mold with a mold clamp machine (50), and plasticization resin is injected by the ahead power of a injection cylinder (48) in metal mold.
[0030] It is constituted by the hydraulic pump (42) made to generate oil pressure as one unit with which four solenoid valves of the solenoid valve for reservoir tanks (46) and the solenoid valve for oil pressure controls (47a) (47b) (47c) were included.
[0031] At the time of a measuring process, a hydraulic pump (42) is driven with a servo motor (41), and an electromagnetic clutch (43) tells actuation of a servo motor (41) at it to a screw (49) as an ON condition through the back end of an injection molding machine (40) to a injection cylinder (48) through a timing belt (44) from a pulley (45). That is, the screw revolution of a measuring process serves as servo motor (41) actuation.
[0032] Moreover, among solenoid valves (46) (47a) (47b) (47c), a solenoid valve (47b) is made into ON condition (block status) except the time of measuring, and a solenoid valve (47c) constitutes the hydraulic circuit for accumulators from the injection cylinder (48) head section as shows as ON a pump absorption line at drawing 1 only at the time of compulsive bleedoff to an accumulator (55).
[0033] It draws in driving a servo motor (41) and measuring a resin raw material from a hopper (52) to a heating cylinder (51). Although a injection cylinder (48) goes astern at this time, measuring back-pressure control is performed so that a injection cylinder (48) may go astern gradually. In this example, it has a pressure sensor (not shown) in the accumulator (55), and the roll control of the servo motor (56) connected to the accumulator (55) so that a back pressure command pressure might be kept constant is carried out (accumulator with a pressure regulation function), and the oil pressure energy of a constant pressure is accumulated.
[0034] The oil pressure by which pressure accumulation was carried out is applicable to actuation of the ejector cylinder at the time of picking out a cast from metal mold, or is blown at the time of the high-speed standup of a pump, is emitted to a line, and is made to contribute to the improvement in the entrainment engine performance. By this, the consumption energy at the time of the high-speed standup of a pump will decrease, and large energy saving will be obtained.
[0035] In addition, since injection and nozzle retreat / shift cylinder flexible process and the mold control process are equivalent to the case where it is shown in drawing 1 in the case of the example shown in drawing 4 , explanation is omitted.
[0036] As explained above, as compared with the conventional oil hydraulic system, large energy saving is realizable. It becomes approximate energy expenditure mostly at an all electric method. In the case of this example, it can constitute from a servo motor of two pieces or three-piece **, and since it can decrease, the activity number of an expensive servo motor can be constituted cheaply. (oar -- using some (five pieces being used generally) servo motors for every process with a light weight, injection, and the object for mold clamp processes, when electric -- comparing)

[Translation done.]

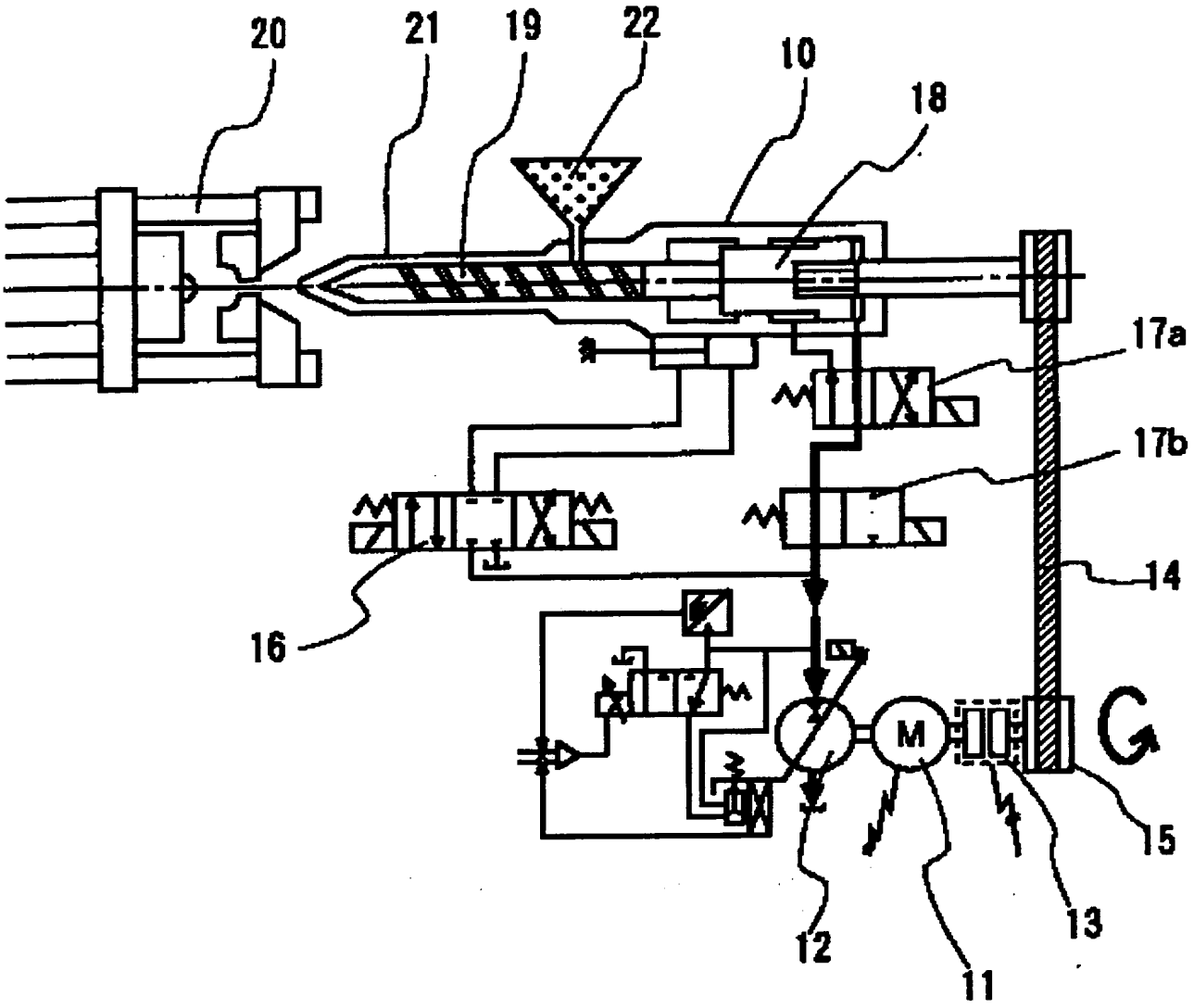
* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the explanatory view showing the system configuration of one example of the measuring process in the injection-molding equipment of this invention.
[Drawing 2] It is the explanatory view showing the system configuration in injection and nozzle retreat / shift cylinder flexible process in the injection-molding equipment shown in drawing 1 .
[Drawing 3] It is the explanatory view showing the system configuration of mold control of the mold clamp machine in the injection-molding equipment of this invention.
[Drawing 4] It is the explanatory view showing the system configuration of another example of the measuring process in the injection-molding equipment of this invention.
[Description of Notations]
(10) (40) -- Injection molding machine,
(11) (41) -- Servo motor,
(12) -- adjustable hydraulic pump-motor,
(42) -- hydraulic pump,
(13) (43) -- Electromagnetic clutch
(14) (44) -- Timing belt,
(15) (45) -- Pulley,
(16) (46) -- Solenoid valve for reservoir tanks,
(17a) (17b) -- Solenoid valve for oil pressure controls,
(47a) -- (47b) (47c) Solenoid valve for oil pressure controls,
(18) (48) -- Injection cylinder,
(19) (49) -- Screw,
(20) (50) -- Mold clamp machine,
(21) (51) -- Heating cylinder
(22) (52) -- Hopper,
(31) The servo motor for -- mold control,
(32) A -- constant regurgitation pump,
(33) The solenoid valve for -- mold clamp control,
(34) The solenoid valve for -- ejection control,
(55) -- accumulator,
(56) -- servo motor,

[Translation done.]


20
21
19
22
10
18
17a
17b
14
16
M
G
15
12
11
13